LC ENGINEERING

Surveying, Civil and Structural Engineering
1291 Oakland Road, San Jose, CA 95112 TEL: (408) 806-7187 / FAX: (408) 583-4006

REGISTERED PROFESSIONAL ENGINEER
M. N. LE
No. 47518
EXP. 12-31-23
CIVIL
STATE OF CALIFORNIA

Project:	**Mr. & Mrs. Helweh - Main House (front)**
Address:	**Scheller Ave, Morgan Hill**
APN:	**712-28-059**
County File No.:	**PLN22-130**
Calculated By:	**HV**
Date:	**11/9/2022**

HYDROLOGY AND HYDRAULIC CALCULATIONS FOR LANDS OF Mr. & Mrs. Helweh - Main House (front)

REFERENCES:

1. County of Santa Clara Drainage Manual (SCDM) 2007, Adopted August 14, 2007
2. County Santa Clara requirements:
   - 2.1. Provide the pre-developed time of concentration, intensity, and peak runoff rate.
   - 2.2. Provide the post-developed time of concentration, intensity, and peak runoff rate. (the 100-year storm return to post-developed flow)
   - 2.3. ASCE for calculation the volume required for detention.
   - 2.4. Size detention pond that allows the release of the a 10 year storm and 100 year overflow.

CALCULATIONS: **(MAIN BUILDING'S FRONT)**

1. From Figure A-2 : Mean Annual Precipitation Map Santa Clara County **(PAGE 5)**

Mean Annual Precipitation (M.A.P) = 21 in/hr

2. Existing conditons

A	= Drainage Basin area	=	1.11 ac
A1	= Developed area	=	0.00 ac
A2	= Undeveloped area (landscape)	=	1.11 ac
$C1 = C_{developed}$	= Coefficient of developed	=	0.85 **Paved / Impervious Surface**
$C2 = C_{undeveloped}$	= Coefficicient undeveloped	=	0.35 **Urban Open Space**

(PAGE 6)

$$C_{existing} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.35$$

3. Future conditons

A	= Drainage Basin Area	=	1.11 ac
A1	= Developed area	=	0.17 ac
A2	= Undeveloped area (landscape)	=	0.94 ac
$C1 = C_{developed}$	= Coefficient of developed	=	0.85 **Paved / Impervious Surface**
$C2 = C_{undeveloped}$	= Coefficicient undeveloped	=	0.35 **Urban Open Space**

(PAGE 6)

$$C_{future} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.43$$

A. EXISTING CONDITIONS

Time of concentration:

$$T_c = 0.0078 \left(\frac{L^2}{S}\right)^{0.385} + 10 \quad \text{(minutes)}$$

Where:

L	= Maximum length of travel, in feet.		=	360.00 ft
H	= Difference in elevation along the effective slope line, in feet.		=	2.05 ft
		High elevation	=	287.39 ft
		Low elevation	=	285.34 ft
S	= Slope in feet per feet.	S = H / L	=	0.006 ft/ft
Tc	= Time of concentration, in minutes.			

$$T_c = 0.0078 \left(\frac{360^2}{0.006}\right)^{0.385} + 10 = 15.2 \text{ minutes} = \mathbf{0.25\ hr}$$

Find rainfall depth X_{TD} (and intensity) for the 10-year storm at 21 M.A.P

From Table B-1 for the 10-year return period. **(PAGE 7)**

T_c = **15.2 minutes** ==> A_{TD} = 0.295782, B_{TD} = 0.004752

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)
= 0.295782 + 0.004752 x 21.0 = **0.3956 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3956 \text{ in}}{0.25 \text{ hr}} = \mathbf{1.58\ in/hr}$$

Peak rate of runoff:

$$Q_{Existing\ Peak} = C \times I \times A = 0.61 \text{ cfs}$$

Where:

C	= Coefficient existing	=	0.35
I	= the rainfall intensity	=	1.58 in/hr
A	= Drainage basin area	=	1.11 ac

B. FUTURE CONDITIONS

Length of travel:

L1 = 130 ft SMALL UPLAND GULLIES
High elevation = 286.75 ft
Low elevation = 285.72 ft
Slope of travel (S1) = 0.79 %

From Figure A-1: Overland Flow Velocity

V1 = 1.75 ft/sec

Time of concentration:

T = T1 = 74 sec = **1.23** minutes **use 5 minutes min**

Wh T1 = L1 / V1 = 74 sec

Find rainfall depth X_{TD} (and intensity) for the 100-year storm at 21 M.A.P

From Table B-2 for the 100-year return period. **(PAGE 8)**

T_c = 5 minutes (0.0833 hr) ==> A_{TD} = 0.269993, B_{TD} = 0.003580

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)
= 0.269993 + 0.003580 x 21.0 = **0.3452 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3452 \text{ in}}{0.0833 \text{ hr}} = 4.14 \text{ in/hr}$$

Peak rate of runoff:

$Q_{future\ peak}$ = C x I x A = 1.98 cfs

Where: C = Coefficient future = 0.43
I = the rainfall intensity = 4.14 in/hr
A = Drainage basin area = 1.11 ac

C. MAXIMUN DRAINAGE STORAGE REQUIRED.

ASCE Method (Constant Outflow)

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)

Volume In = A (ac) x (C+0.15) x (Depth/12) x 43,560 (ft^2/ac) (add 0.15 to C develop)

for 10-year storm

T	10-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.2452	573	183	390	
10-min	0.3336	780	366	414	**414**
15-min	0.3937	920	549	371	
30-min	0.5333	1,246	1,098	148	
1-hr	0.7386	1,726	2,196	-470	
2-hr	1.0992	2,569	4,392	-1,823	
3-hr	1.4095	3,294	6,588	-3,294	
6-hr	2.1101	4,931	13,176	-8,245	
12-hr	2.9865	6,979	26,352	-19,373	

for 100-year storm

T	100-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.3452	807	183	624	
10-min	0.4688	1,096	366	730	
15-min	0.5675	1,326	549	777	**777**
30-min	0.7609	1,778	1,098	680	
1-hr	1.0298	2,407	2,196	211	
2-hr	1.4930	3,489	4,392	-903	
3-hr	1.9081	4,459	6,588	-2,129	
6-hr	2.8988	6,774	13,176	-6,402	
12-hr	4.2277	9,880	26,352	-16,472	

$V_{max\ stogare\ required}$ = 777 cf

D. DETENTION SIZING CALCULATIONS

Require Storage **777 cf** (allows for 10-year storm and 100-year storm)

Assumed Trench with:

Shape	=	Trapezoid
Bottom Elev	=	283.60 ft
Bottom Length	=	40.00 ft
Bottom Width	=	2.00 ft
Side Slope	=	3:1
Depth	=	2.00 ft
Volume of pond	=	**808.00** cf

Detention Volume:

V_{pond} = Volume of pond = 808.00 cf > $V_{require\ storage}$ = 777.00 cf **OK**

USE TRAPEZOID RETENTION POND (SEE GRADING PLAN FOR DETAIL)

CALCULATIONS: **(MAIN BUILDING' REAR)**

1. From Figure A-2 : Mean Annual Precipitation Map Santa Clara County **(PAGE 5)**

Mean Annual Precipitation (M.A.P) = 21 in/hr

2. Existing conditons

A	= Drainage Basin area	=	0.35 ac	
A1	= Developed area	=	0.00 ac	
A2	= Undeveloped area (landscape)	=	0.35 ac	
$C1 = C_{developed}$	= Coefficient of developed	=	0.85	**Paved / Impervious Surface**
$C2 = C_{undeveloped}$	= Coefficient undeveloped	=	0.35	**Urban Open Space**
				(PAGE 6)

$$C_{existing} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.35$$

3. Future conditons

A	= Drainage Basin Area	=	0.35 ac	
A1	= Developed area	=	0.12 ac	
A2	= Undeveloped area (landscape)	=	0.23 ac	
$C1 = C_{developed}$	= Coefficient of developed	=	0.85	**Paved / Impervious Surface**
$C2 = C_{undeveloped}$	= Coefficient undeveloped	=	0.35	**Urban Open Space**
				(PAGE 6)

$$C_{future} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.52$$

A. EXISTING CONDITIONS

Time of concentration:

$$T_c = 0.0078 \left(\frac{L^2}{S}\right)^{0.385} + 10 \quad \text{(minutes)}$$

Where:

L	= Maximum length of travel, in feet.		=	215.00 ft
H	= Difference in elevation along the effective slope line, in feet.		=	0.65 ft
		High elevation	=	286.75 ft
		Low elevation	=	286.10 ft
S	= Slope in feet per feet.	S = H / L	=	0.003 ft/ft
Tc	= Time of concentration, in minutes.			

$$T_c = 0.0078 \left(\frac{215^{2}}{0.003}\right)^{0.385} + 10 = 14.56 \text{ minutes} = \mathbf{0.24\ hr}$$

Find rainfall depth X_{TD} (and intensity) for the 10-year storm at 21 M.A.P

From Table B-1 for the 10-year return period. **(PAGE 7)**

T_c = **14.56 minutes** ==> A_{TD} = 0.291629; B_{TD} = 0.004610

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)

= 0.291629 + 0.004610 x 21.0 = **0.3884 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3884 \text{ in}}{0.24 \text{ hr}} = \mathbf{1.62\ in/hr}$$

Peak rate of runoff:

$Q_{Existing\ Peak}$ = C x I x A = 0.20 cfs

Where:	C	= Coefficient existing	=	0.35
	I	= the rainfall intensity	=	1.62 in/hr
	A	= Drainage basin area	=	0.35 ac

B. FUTURE CONDITIONS

Length of travel:

L1 = 240 ft SMALL UPLAND GULLIES

High elevation	=	286.75 ft
Low elevation	=	284.52 ft
Slope of travel (S1)	=	0.93 %

From Figure A-1: Overland Flow Velocity

V1 = 1.88 ft/sec

Time of concentration:

T = T1 = 128 sec = **2.13** minutes **use 5 minutes min**

Wh T1 = L1 / V1 = 128 sec

Find rainfall depth X_{TD} (and intensity) for the 100-year storm at 21 M.A.P

From Table B-2 for the 100-year return period. **(PAGE 8)**

T_c = 5 minutes ==> A_{TD} = 0.269993
(0.0833 hr) B_{TD} = 0.003580

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)
= 0.269993 + 0.003580 x 21.0 = **0.3452 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3452 \text{ in}}{0.0833 \text{ hr}} = 4.14 \text{ in/hr}$$

Peak rate of runoff:

$Q_{future\ peak}$ = C x I x A = 0.75 cfs

Where: C = Coefficicient future = 0.52
I = the rainfall intensity = 4.14 in/hr
A = Drainage basin area = 0.35 ac

C. MAXIMUN DRAINAGE STORAGE REQUIRED.

ASCE Method (Constant Outflow)

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)

Volume In = A (ac) x (C+0.15) x (Depth/12) x 43,560 (ft^2/ac) (add 0.15 to C develop)

for 10-year storm

T	10-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.2452	209	60	149	
10-min	0.3336	284	120	164	**164**
15-min	0.3937	335	180	155	
30-min	0.5333	454	360	94	
1-hr	0.7386	629	720	-91	
2-hr	1.0992	936	1,440	-504	
3-hr	1.4095	1,200	2,160	-960	
6-hr	2.1101	1,796	4,320	-2,524	
12-hr	2.9865	2,542	8,640	-6,098	

for 100-year storm

T	100-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.3452	294	60	234	
10-min	0.4688	399	120	279	
15-min	0.5675	483	180	303	**303**
30-min	0.7609	648	360	288	
1-hr	1.0298	877	720	157	
2-hr	1.4930	1,271	1,440	-169	
3-hr	1.9081	1,627	2,160	-533	
6-hr	2.8988	2,468	4,320	-1,852	
12-hr	4.2277	3,599	8,640	-5,041	

$V_{max\ stogare\ required}$ = 303 cf

D. DETENTION SIZING CALCULATIONS

Require Storage **303 cf** (allows for 10-year storm and 100-year storm)

Assumed Trench with:

Shape = V
Bottom Length = 234.00 ft
Bottom Width = 0.00 ft
Side Slope = 3:1
Depth = 0.67 ft

Volume of Retention Swale = **320.54** cf

Detention Volume:

V_{pond} = Volume of Swale = 320.54 cf > $V_{require\ storage}$ = 303.00 cf **OK**

USE RETENTION SWALE (SEE GRADING PLAN FOR DETAIL)

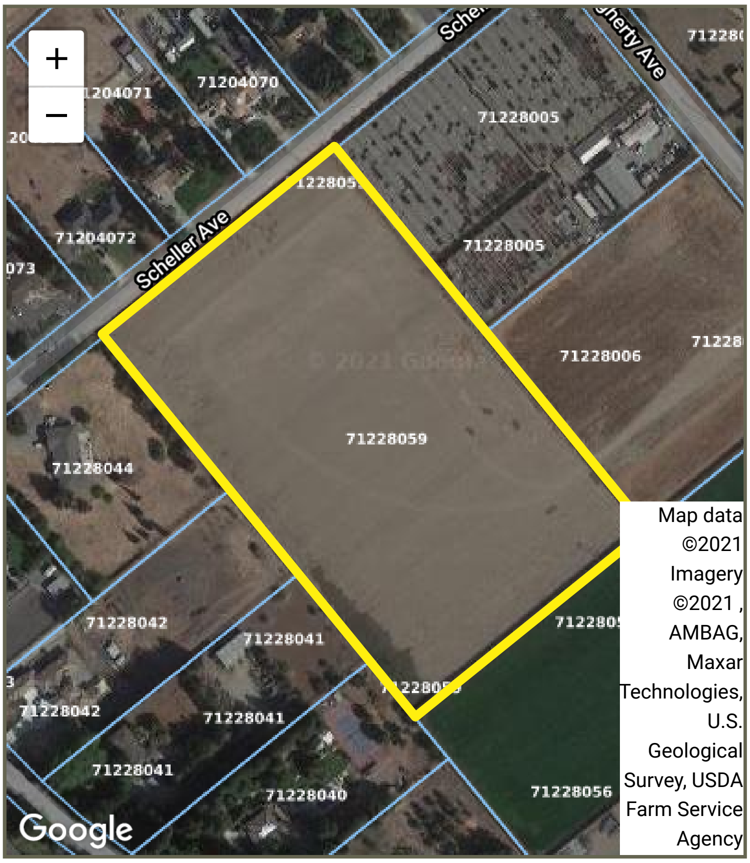
Santa Clara County
Department of Planning and Development

Online Property Profile

COUNTY OF SANTA CLARA PLANNING OFFICE
70 W. HEDDING ST., SAN JOSE, CA 95110
(408) 299-5770

Property Location Information

APN: **712-28-059**
Site Address: **SCHELLER AV MORGAN HILL CA 95037-9343**
Recorded Size (Assessor Database): **435,600 sq. ft. / 10 acres**
Computed Size (GIS): **423,684 sq. ft. / 9.7 acres**
TRA: **87031**



Planning and Development Information

General Plan: **Agriculture Large Scale (100%)**
USA: ***None***
SOI: **San Jose**
Zoning: **A-40Ac (100%)**
Supervisor District: **1**
Approved Building Site: **Research needed to evaluate parcel as a Building Site**

Special Area Policies and Information

- Property located within Coyote Valley
- HCP Area
- HCP Rural Development Areas: **IN**
- Fire Responsibility Area: LRA (100%)
- Fire Protection District: South Santa Clara County Fire Protection District
- Geohazard: County fault rupture hazard zone
- Geohazard: County liquefaction hazard zone
- Geohazard: State seismic hazard zone (liquefaction)
- Historic Parcel: NO
- FEMA Flood Zone: D (100%)
- Watershed: San Francisco Bay
- Rain isohyet: 21 inches

  Nearest named creek: FISHER CREEK (2605 feet)

  Nearest named lake: Calero Reservoir (13489 feet)
- Near county maintained road(s): SCHELLER AVENUE

In Table 3-1 Soil Types B, C and D are based on the SCS classification of HSG. This designation is a standard designation used by the SCS and has been defined for Santa Clara County in existing SCS publications. D-type soils are less permeable than are C-type soils, which are, in turn, less permeable than B-type soils.

Table 3-1: Runoff Coefficients for Rational Formula

Land Use	C for Soil Type		
	B	C	D
Low Density Residential	0.30	0.40	0.45
Medium Density Residential	0.50	0.55	0.60
High Density Residential	0.70	0.70	0.75
Commercial	0.80	0.80	0.80
Industrial	0.70	0.75	0.75
Parks	0.20	0.30	0.35
Agricultural	0.15	0.35	0.40
Urban Open Space	0.10	0.35	0.45
Shrub Land	0.10	0.20	0.30
Paved / Impervious Surface	0.85	0.85	0.85

The Rational Method implies that this ratio is fixed for a given drainage basin. Studies have shown, however, that the coefficient may vary with respect to prior wetting and seasonal conditions (antecedent moisture). It has also been observed that as rainfall intensity increases, soil permeability decreases. One may sense that runoff coefficients should increase with rainfall intensity.

Applying such non-linearities over relatively small urbanized drainage basins does not necessarily improve hydrologic precision enough to offset the more difficult computations, so using a constant runoff coefficient is standard in Santa Clara County. For watersheds with significant variation in antecedent moisture conditions, soil types, or other complexities, however; the hydrograph method described in Chapter 4 should be employed regardless of basin size.

Table B-1: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

2-YR RETURN PERIOD		
5-min	0.120194	0.001385
10-min	0.166507	0.001956
15-min	0.176618	0.003181
30-min	0.212497	0.005950
1-hr	0.253885	0.010792
2-hr	0.330848	0.019418
3-hr	0.374053	0.027327
6-hr	0.425178	0.045735
12-hr	0.409397	0.069267
24-hr	0.314185	0.096343
48-hr	0.444080	0.134537
72-hr	0.447104	0.159461
5-YR RETURN PERIOD		
5-min	0.170347	0.001857
10-min	0.228482	0.002758
15-min	0.250029	0.004036
30-min	0.307588	0.007082
1-hr	0.357109	0.013400
2-hr	0.451840	0.024242
3-hr	0.512583	0.034359
6-hr	0.554937	0.060859
12-hr	0.562227	0.094871
24-hr	0.474528	0.136056
48-hr	0.692427	0.187173
72-hr	0.673277	0.224003
10-YR RETURN PERIOD		
5-min	0.201876	0.002063
10-min	0.258682	0.003569
15-min	0.294808	0.004710
30-min	0.367861	0.007879
1-hr	0.427723	0.014802
2-hr	0.522608	0.027457
3-hr	0.591660	0.038944
6-hr	0.625054	0.070715
12-hr	0.641638	0.111660
24-hr	0.567017	0.162550
48-hr	0.832445	0.221820
72-hr	0.810509	0.265469

Table B-2: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

Return Period/Duration	$A_{T,D}$	$B_{T,D}$
25-YR RETURN PERIOD		
5-min	0.230641	0.002691
10-min	0.287566	0.004930
15-min	0.348021	0.005594
30-min	0.443761	0.008719
1-hr	0.508791	0.016680
2-hr	0.612629	0.031025
3-hr	0.689252	0.044264
6-hr	0.693566	0.083195
12-hr	0.725892	0.132326
24-hr	0.675008	0.195496
48-hr	0.989588	0.264703
72-hr	0.967854	0.316424
50-YR RETURN PERIOD		
5-min	0.249324	0.003241
10-min	0.300971	0.006161
15-min	0.384016	0.006315
30-min	0.496301	0.009417
1-hr	0.568345	0.017953
2-hr	0.672662	0.033694
3-hr	0.754661	0.048157
6-hr	0.740666	0.092105
12-hr	0.779967	0.147303
24-hr	0.747121	0.219673
48-hr	1.108358	0.295510
72-hr	1.075643	0.353143
100-YR RETURN PERIOD		
5-min	0.269993	0.003580
10-min	0.315263	0.007312
15-min	0.421360	0.006957
30-min	0.553934	0.009857
1-hr	0.626608	0.019201
2-hr	0.732944	0.036193
3-hr	0.816471	0.051981
6-hr	0.776677	0.101053
12-hr	0.821859	0.162184
24-hr	0.814046	0.243391
48-hr	1.210895	0.325943
72-hr	1.175000	0.389038

LC ENGINEERING

Surveying, Civil and Structural Engineering
1291 Oakland Road, San Jose, CA 95112 TEL: (408) 806-7187 / FAX: (408) 583-4006

REGISTERED PROFESSIONAL ENGINEER
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HYDROLOGY AND HYDRAULIC CALCULATIONS FOR LANDS OF Mr. & Mrs. Helweh

REFERENCES:

1. County of Santa Clara Drainage Manual (SCDM) 2007, Adopted August 14, 2007
2. County Santa Clara requirements:
   - 2.1. Provide the pre-developed time of concentration, intensity, and peak runoff rate.
   - 2.2. Provide the post-developed time of concentration, intensity, and peak runoff rate. (the 100-year storm return to post-developed flow)
   - 2.3. ASCE for calculation the volume required for detention.
   - 2.4. Size detention pond that allows the release of the a 10 year storm and 100 year overflow.

CALCULATIONS: (ADU'S FRONT)

1. From Figure A-2 : Mean Annual Precipitation Map Santa Clara County (PAGE 5)

Mean Annual Precipitation (M.A.P) = 21 in/hr

2. Existing conditons

A	= Drainage Basin area	=	0.57 sf
A1	= Developed area	=	0.00 sf
A2	= Undeveloped area (landscape)	=	0.57 sf
$C1 = C_{developed}$	= Coefficient of developed	=	0.85 **Paved / Impervious Surface**
$C2 = C_{undeveloped}$	= Coefficicient undeveloped	=	0.35 **Urban Open Space**

(PAGE 6)

$$C_{existing} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.35$$

3. Future conditons

A	= Drainage Basin Area	=	0.57 sf
A1	= Developed area	=	0.08 sf
A2	= Undeveloped area (landscape)	=	0.49 sf
$C1 = C_{developed}$	= Coefficient of developed	=	0.85 **Paved / Impervious Surface**
$C2 = C_{undeveloped}$	= Coefficicient undeveloped	=	0.35 **Urban Open Space**

(PAGE 6)

$$C_{future} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.42$$

A. EXISTING CONDITIONS

Time of concentration:

$$T_c = 0.0078 \left(\frac{L^2}{S}\right)^{0.385} + 10 \quad \text{(minutes)}$$

Where:

L	= Maximum length of travel, in feet.		=	245.00 ft
H	= Difference in elevation along the effective slope line, in feet.		=	1.25 ft
		High elevation	=	288.34 ft
		Low elevation	=	287.09 ft
S	= Slope in feet per feet.	S = H / L	=	0.005 ft/ft
Tc	= Time of concentration, in minutes.			

$$T_c = 0.0078 \left(\frac{245^2}{0.005}\right)^{0.385} + 10 = 14.15 \text{ minutes} = \mathbf{0.24\ hr}$$

Find rainfall depth X_{TD} (and intensity) for the 10-year storm at 21 M.A.P

From Table B-1 for the 10-year return period. (PAGE 7)

T_c = **14.15 minutes** ==> A_{TD} 0.288667, B_{TD} 0.004516

Depth $X_{TD} = A_{TD} + (B_{TD}) \times (M.A.P)$
$= 0.288667 + 0.004516 \times 21.0 =$ **0.3835 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3835 \text{ in}}{0.24 \text{ hr}} = \mathbf{1.60\ in/hr}$$

Peak rate of runoff:

$$Q_{Existing\ Peak} = C \times I \times A = 0.32$$

Where:

C	= Coefficient existing	=	0.35
I	= the rainfall intensity	=	1.60 in/hr
A	= Drainage basin area	=	0.57 sf

B. FUTURE CONDITIONS

Length of travel:

L1 = 271 ft SMALL UPLAND GULLIES
High elevation = 287.47 ft
Low elevation = 286.25 ft
Slope of travel (S1) = 0.5 %

From Figure A-1: Overland Flow Velocity

V1 = 1.50 ft/sec

Time of concentration:

T = T1 = 181 sec = **3.02** minutes **use 5 minutes min**

Wh T1 = L1 / V1 = 181 sec

Find rainfall depth X_{TD} (and intensity) for the 100-year storm 21.00

From Table B-2 for the 100-year return period. **(PAGE 8)**

T_c = 5 minutes ==> A_{TD} 0.269993
(0.0833 hr) B_{TD} 0.003580

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)
= 0.269993 + 0.003580 x 21.0 = **0.3452 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3452 \text{ in}}{0.0833 \text{ hr}} = 4.14 \text{ in/hr}$$

Peak rate of runoff:

$Q_{future\ peak}$ = C x I x A = 0.99 cfs

Where: C = Coefficicient future = 0.42
I = the rainfall intensity = 4.14 in/hr
A = Drainage basin area = 0.57 ac

C. MAXIMUN DRAINAGE STORAGE REQUIRED.

ASCE Method (Constant Outflow)

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)

Volume In = A (ac) x (C+0.15) x (Depth/12) x 43,560 (ft^2/ac) (add 0.15 to C develop)

for 10-year storm

T	10-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.2452	289	96	193.00	
10-min	0.3336	393	192	201.00	**201**
15-min	0.3937	464	288	176.00	
30-min	0.5333	629	576	53.00	
1-hr	0.7386	871	1,152	-281.00	
2-hr	1.0992	1,296	2,304	-1,008.00	
3-hr	1.4095	1,662	3,456	-1,794.00	
6-hr	2.1101	2,489	6,912	-4,423.00	
12-hr	2.9865	3,522	13,824	-10,302.00	

for 100-year storm

T	100-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.3452	407	96	311.00	
10-min	0.4688	553	192	361.00	
15-min	0.5675	669	288	381.00	**381**
30-min	0.7609	897	576	321.00	
1-hr	1.0298	1,215	1,152	63.00	
2-hr	1.4930	1,761	2,304	-543.00	
3-hr	1.9081	2,250	3,456	-1,206.00	
6-hr	2.8988	3,419	6,912	-3,493.00	
12-hr	4.2277	4,986	13,824	-8,838.00	

$V_{max\ stogare\ required}$ = 381 cf

D. DETENTION SIZING CALCULATIONS

Require Storage **381 cf** (allows for 10-year storm and 100-year storm)

Assumed Trench with:

Shape = V
Bottom Length = 92.00 ft
Side Slope = 3:1
Depth = 0.83 ft

Volume of Retention Swale = **200.43** cf

Shape	=	V
Bottom Length	=	177.00 ft
Side Slope	=	3:1
Depth	=	0.67 ft
Volume of Retention Swale	=	**243.78** cf

`

V_{swale} = 444.21 cf

Detention Volume:

V_{pond} = Volume of Swale = 444.21 cf > $V_{require\ storage}$ = 381.00 cf OK

USE RETENTION SWALE (SEE GRADING PLAN FOR DETAIL)

CALCULATIONS: **(ADU'S REAR)**

1. From Figure A-2 : Mean Annual Precipitation Map Santa Clara County **(PAGE 5)**

Mean Annual Precipitation (M.A.P) = 21 in/hr

2. Existing conditons

A	= Drainage Basin area	=	0.19 ac
A1	= Developed area	=	0.00 ac
A2	= Undeveloped area (landscape)	=	0.19 ac
C1 = $C_{developed}$	= Coefficient of developed	=	0.85 **Paved / Impervious Surface**
C2 = $C_{undeveloped}$	= Coefficicient undeveloped	=	0.35 **Urban Open Space**
			(PAGE 6)

$$C_{existing} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.35$$

3. Future conditons

A	= Drainage Basin Area	=	0.19 ac
A1	= Developed area	=	0.03 ac
A2	= Undeveloped area (landscape)	=	0.16 ac
C1 = $C_{developed}$	= Coefficient of developed	=	0.85 **Paved / Impervious Surface**
C2 = $C_{undeveloped}$	= Coefficicient undeveloped	=	0.35 **Urban Open Space**
			(PAGE 6)

$$C_{future} = C_{average} = \frac{[(A1xC1) + (A2xC2)]}{(A1+A2)} = 0.43$$

A. EXISTING CONDITIONS

Time of concentration:

$$T_c = 0.0078 \left(\frac{L^2}{S}\right)^{0.385} + 10 \quad \text{(minutes)}$$

Where:

L	= Maximum length of travel, in feet.		=	165.00 ft
H	= Difference in elevation along the effective slope line, in feet.		=	0.93 ft
		High elevation	=	288.08 ft
		Low elevation	=	287.15 ft
S	= Slope in feet per feet.	S = H / L	=	0.006 ft/ft
Tc	= Time of concentration, in minutes.			

$$T_c = 0.0078 \left(\frac{165^{\ 2}}{0.006}\right)^{0.385} + 10 = 12.85 \text{ minutes} = \mathbf{0.21\ hr}$$

Find rainfall depth X_{TD} (and intensity) for the 10-year storm at 21 M.A.P

From Table B-1 for the 10-year return period. **(PAGE 7)**

T_c = 12.85 minutes ==> A_{TD} = 0.279274
B_{TD} = 0.004219

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)
= 0.279274 + 0.004219 x 21.0 = **0.3679 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3679\ in}{0.21\ hr} = 1.75\ in/hr$$

Peak rate of runoff:

$Q_{Existing\ Peak}$ = C x I x A = 0.12 cfs

Where:	C	= Coefficient existing	=	0.35
	I	= the rainfall intensity	=	1.75 in/hr
	A	= Drainage basin area	=	0.19 ac

B. FUTURE CONDITIONS

Length of travel:

L1 =	118 ft		SMALL UPLAND GULLIES
High elevation		=	287.47 ft
Low elevation		=	286.50 ft
Slope of travel (S1)		=	0.82 %

From Figure A-1: Overland Flow Velocity

V1 = 1.78 ft/sec

Time of concentration:

T = T1 = 66 sec = **1.10** minutes **use 5 minutes min**

Wł T1 = L1 / V1 = 66 sec

Find rainfall depth X_{TD} (and intensity) for the 100-year storm at 21 M.A.P

From Table B-2 for the 100-year return period. **(PAGE 8)**

T_c = 5 minutes ==> A_{TD} = 0.269993
(0.0833 hr) B_{TD} = 0.003580

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)
= 0.269993 + 0.003580 x 21.0 = **0.3452 in**

Rainfall intensity:

$$I = \frac{X_{TD}}{Tc} = \frac{0.3452 \text{ in}}{0.0833 \text{ hr}} = 4.14 \text{ in/hr}$$

Peak rate of runoff:

$Q_{future\ peak}$ = C x I x A = 0.34 cfs

Where: C = Coefficicient future = 0.43
I = the rainfall intensity = 4.14 in/hr
A = Drainage basin area = 0.19 ac

C. MAXIMUN DRAINAGE STORAGE REQUIRED.

ASCE Method (Constant Outflow)

Depth X_{TD} = A_{TD} + (B_{TD}) x (M.A.P)

Volume In = A (ac) x (C+0.15) x (Depth/12) x 43,560 (ft^2/ac) (add 0.15 to C develop)

for 10-year storm

T	10-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.2452	98	36	62	
10-min	0.3336	133	72	61	**67**
15-min	0.3937	157	108	49	
30-min	0.5333	213	216	-3	
1-hr	0.7386	295	432	-137	
2-hr	0.1099	440	864	-424	
3-hr	1.4095	564	1,296	-732	
6-hr	2.1101	844	2,592	-1,748	
12-hr	2.9865	1,195	5,184	-3,989	

for 100-year storm

T	100-Yr Depth (in)	Volume In (cf)	Volume Out (cf)	Storage (cf)	MAX STORAGE (cf)
5-min	0.3452	138	36	102	
10-min	0.4688	188	72	116	
15-min	0.5675	227	108	119	**128**
30-min	0.7609	304	216	88	
1-hr	1.0298	412	432	-20	
2-hr	1.4930	597	864	-267	
3-hr	1.9081	763	1,296	-533	
6-hr	2.8988	1,160	2,592	-1,432	
12-hr	4.2277	1,691	5,184	-3,493	

$V_{max\ stogare\ required}$ = 119 cf

D. DETENTION SIZING CALCULATIONS

Require Storage **119 cf** (allows for 10-year storm and 100-year storm)

Assumed Trench with:

Shape = V
Bottom Length = 118.00 ft
Side Slope = 3:1
Depth = 0.67 ft

Volume of Retention Swale = **164.32** cf

Detention Volume:

V_{pond} = Volume of Swale = 164.32 cf > $V_{require\ storage}$ = 119.00 cf **OK**

USE RETENTION SWALE (SEE GRADING PLAN FOR DETAIL)

Santa Clara County
Department of Planning and Development

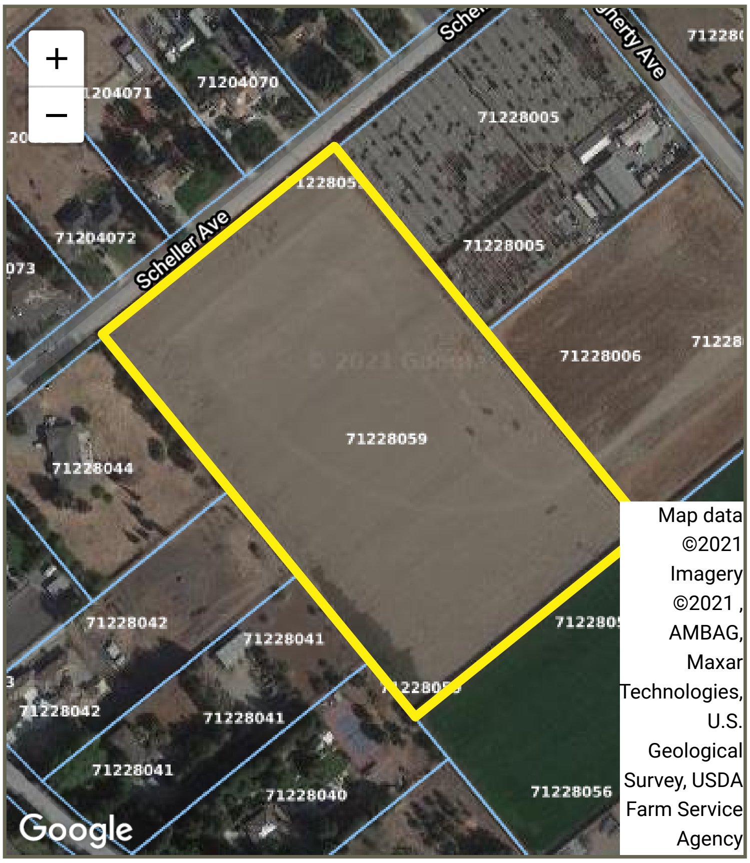
Online Property Profile

COUNTY OF SANTA CLARA PLANNING OFFICE
70 W. HEDDING ST., SAN JOSE, CA 95110
(408) 299-5770

April 25, 2021 10:43:39 AM. The GIS data used in this analysis was compiled from various sources. While deemed reliable, the Planning Office assumes no liability.

Property Location Information

APN: **712-28-059**
Site Address: **SCHELLER AV MORGAN HILL CA 95037-9343**
Recorded Size (Assessor Database): **435,600 sq. ft. / 10 acres**
Computed Size (GIS): **423,684 sq. ft. / 9.7 acres**
TRA: **87031**



Planning and Development Information

General Plan: **Agriculture Large Scale (100%)**
USA: ***None***
SOI: **San Jose**
Zoning: **A-40Ac (100%)**
Supervisor District: **1**
Approved Building Site: **Research needed to evaluate parcel as a Building Site**

Special Area Policies and Information

- Property located within Coyote Valley
- HCP Area
- HCP Rural Development Areas: **IN**
- Fire Responsibility Area: LRA (100%)
- Fire Protection District: South Santa Clara County Fire Protection District
- Geohazard: County fault rupture hazard zone
- Geohazard: County liquefaction hazard zone
- Geohazard: State seismic hazard zone (liquefaction)
- Historic Parcel: NO
- FEMA Flood Zone: D (100%)
- Watershed: San Francisco Bay
- Rain isohyet: 21 inches
  Nearest named creek: FISHER CREEK (2605 feet)
  Nearest named lake: Calero Reservoir (13489 feet)
- Near county maintained road(s): SCHELLER AVENUE

In Table 3-1 Soil Types B, C and D are based on the SCS classification of HSG. This designation is a standard designation used by the SCS and has been defined for Santa Clara County in existing SCS publications. D-type soils are less permeable than are C-type soils, which are, in turn, less permeable than B-type soils.

Table 3-1: Runoff Coefficients for Rational Formula

Land Use	C for Soil Type		
	B	C	D
Low Density Residential	0.30	0.40	0.45
Medium Density Residential	0.50	0.55	0.60
High Density Residential	0.70	0.70	0.75
Commercial	0.80	0.80	0.80
Industrial	0.70	0.75	0.75
Parks	0.20	0.30	0.35
Agricultural	0.15	0.35	0.40
Urban Open Space	0.10	0.35	0.45
Shrub Land	0.10	0.20	0.30
Paved / Impervious Surface	0.85	0.85	0.85

The Rational Method implies that this ratio is fixed for a given drainage basin. Studies have shown, however, that the coefficient may vary with respect to prior wetting and seasonal conditions (antecedent moisture). It has also been observed that as rainfall intensity increases, soil permeability decreases. One may sense that runoff coefficients should increase with rainfall intensity.

Applying such non-linearities over relatively small urbanized drainage basins does not necessarily improve hydrologic precision enough to offset the more difficult computations, so using a constant runoff coefficient is standard in Santa Clara County. For watersheds with significant variation in antecedent moisture conditions, soil types, or other complexities, however; the hydrograph method described in Chapter 4 should be employed regardless of basin size.

Table B-1: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

2-YR RETURN PERIOD		
5-min	0.120194	0.001385
10-min	0.166507	0.001956
15-min	0.176618	0.003181
30-min	0.212497	0.005950
1-hr	0.253885	0.010792
2-hr	0.330848	0.019418
3-hr	0.374053	0.027327
6-hr	0.425178	0.045735
12-hr	0.409397	0.069267
24-hr	0.314185	0.096343
48-hr	0.444080	0.134537
72-hr	0.447104	0.159461
5-YR RETURN PERIOD		
5-min	0.170347	0.001857
10-min	0.228482	0.002758
15-min	0.250029	0.004036
30-min	0.307588	0.007082
1-hr	0.357109	0.013400
2-hr	0.451840	0.024242
3-hr	0.512583	0.034359
6-hr	0.554937	0.060859
12-hr	0.562227	0.094871
24-hr	0.474528	0.136056
48-hr	0.692427	0.187173
72-hr	0.673277	0.224003
10-YR RETURN PERIOD		
5-min	0.201876	0.002063
10-min	0.258682	0.003569
15-min	0.294808	0.004710
30-min	0.367861	0.007879
1-hr	0.427723	0.014802
2-hr	0.522608	0.027457
3-hr	0.591660	0.038944
6-hr	0.625054	0.070715
12-hr	0.641638	0.111660
24-hr	0.567017	0.162550
48-hr	0.832445	0.221820
72-hr	0.810509	0.265469

Table B-2: Parameters $A_{T,D}$ and $B_{T,D}$ for TDS Equation

Return Period/Duration	$A_{T,D}$	$B_{T,D}$
25-YR RETURN PERIOD		
5-min	0.230641	0.002691
10-min	0.287566	0.004930
15-min	0.348021	0.005594
30-min	0.443761	0.008719
1-hr	0.508791	0.016680
2-hr	0.612629	0.031025
3-hr	0.689252	0.044264
6-hr	0.693566	0.083195
12-hr	0.725892	0.132326
24-hr	0.675008	0.195496
48-hr	0.989588	0.264703
72-hr	0.967854	0.316424
50-YR RETURN PERIOD		
5-min	0.249324	0.003241
10-min	0.300971	0.006161
15-min	0.384016	0.006315
30-min	0.496301	0.009417
1-hr	0.568345	0.017953
2-hr	0.672662	0.033694
3-hr	0.754661	0.048157
6-hr	0.740666	0.092105
12-hr	0.779967	0.147303
24-hr	0.747121	0.219673
48-hr	1.108358	0.295510
72-hr	1.075643	0.353143
100-YR RETURN PERIOD		
5-min	0.269993	0.003580
10-min	0.315263	0.007312
15-min	0.421360	0.006957
30-min	0.553934	0.009857
1-hr	0.626608	0.019201
2-hr	0.732944	0.036193
3-hr	0.816471	0.051981
6-hr	0.776677	0.101053
12-hr	0.821859	0.162184
24-hr	0.814046	0.243391
48-hr	1.210895	0.325943
72-hr	1.175000	0.389038